WHAT IS CLAIMED IS:

1. A vehicle dynamics control apparatus comprising:

sensors that detect at least a turning condition and a driving condition of a host vehicle;

an actuator that produces a yaw moment acting on the host vehicle; and

a control unit configured to be electronically connected to the sensors and the actuator, for enabling vehicle dynamics control and lane deviation prevention control, the control unit comprising:

(a) a driving stability decision section that determines a driving stability including a vehicle driveability and a vehicle stability, based on at least the turning condition;

(b) a yawing-motion control section that controls a yawing motion of the host vehicle by producing the yaw moment corresponding to a final desired yaw moment and acting in a direction that improves the driving stability when the driving stability is deteriorated, the final desired yaw moment being determined to be equal to a controlled variable of the lane deviation prevention control when the vehicle dynamics control is inoperative and determined to be equal to a controlled variable of the vehicle dynamics control when the vehicle dynamics control is operative;

(c) a lane deviation prevention section that determines, based on the driving condition, a lane-deviation tendency of the host vehicle from a driving lane, and executes the lane deviation prevention control by producing the yaw moment corresponding to the controlled variable of the lane deviation prevention control and acting in a direction that lane deviation is prevented; and

(d) a driving stability decision compensation section that compensates for a decision of the driving stability, based on the controlled variable of the lane deviation prevention control.

2. The vehicle dynamics control apparatus as claimed in claim 1, wherein:

the driving stability decision section that determines the driving stability based on at least one of a yaw-rate deviation between an actual yaw rate resulting from the yaw moment acting on the host vehicle and a final desired yaw rate estimated based on a steer angle and a host vehicle speed, a sideslip angle of the host vehicle, and a rate of change of the sideslip angle.

3. The vehicle dynamics control apparatus as claimed in claim 1, wherein:

the driving stability decision section that determines the driving stability based on at least one of a yaw-rate deviation between an actual yaw rate resulting from the yaw moment acting on a host vehicle and a final desired yaw rate estimated based on a steer angle and a host vehicle speed, a sideslip-angle deviation between an actual sideslip angle of the host vehicle and a desired sideslip angle estimated based on the host vehicle speed, the steer angle, and a road-surface friction coefficient, and a rate of change of the sideslip-angle deviation.

4. The vehicle dynamics control apparatus as claimed in claim 1, wherein:

the driving stability decision compensation section that compensates for the decision of the driving stability by changing a criterion, which is used to determine the driving

stability, based on the controlled variable of the lane deviation prevention control, only when the lane deviation prevention section is executing the lane deviation prevention control.

5. A vehicle dynamics control apparatus comprising:

sensors that detect at least an actual yaw rate, a yaw angle, a host vehicle speed, and a steer angle;

an actuator that produces a yaw moment acting on the host vehicle; and

a control unit configured to be electronically connected to the sensors and the actuator, for enabling vehicle dynamics control and lane deviation prevention control, the control unit comprising:

(a) a desired yaw rate calculation section that calculates a desired yaw rate based on at least the host vehicle speed and the steer angle;

(b) a driving stability decision section that determines a driving stability including a vehicle driveability and a vehicle stability, based on at least a yaw-rate deviation between the actual yaw rate and a final desired yaw rate;

(c) a yawing-motion control section that controls a yawing motion of the host vehicle by producing the yaw moment corresponding to a final desired yaw moment and acting in a direction that improves the driving stability when the driving stability is deteriorated, the final desired yaw moment being determined to be equal to a controlled variable of the lane deviation prevention control when the vehicle dynamics control is inoperative and determined to be equal to a controlled variable of the vehicle dynamics control when the vehicle dynamics control is operative;

(d) a lane deviation prevention section that determines, based on at least the host vehicle speed and the yaw angle, a lane-deviation tendency of the host vehicle from a driving lane, and executes the lane deviation prevention control by producing the yaw moment corresponding to the controlled variable of the lane deviation prevention control and acting in a direction that lane deviation is prevented; and

(e) a desired yaw rate compensation section that compensates for the desired yaw rate based on the controlled variable of the lane deviation prevention control to produce the final desired yaw rate.

6. A vehicle dynamics control apparatus comprising:

sensors that detect at least an actual yaw rate, a yaw angle, a host vehicle speed, and a steer angle;

an actuator that produces a yaw moment acting on the host vehicle; and

a control unit configured to be electronically connected to the sensors and the actuator, for enabling vehicle dynamics control and lane deviation prevention control, the control unit comprising:

(a) a lane deviation prevention section that determines, based on at least the host vehicle speed and the yaw angle, a lane-deviation tendency of the host vehicle from a driving lane, and executes the lane deviation prevention control by producing the yaw moment corresponding to a controlled variable of the lane deviation prevention control and acting in a direction that lane deviation is prevented;

(b) an equivalent steer angle calculation section that calculates an equivalent steer angle equivalent to the controlled variable of the lane deviation prevention control;

(c) a steer-angle correction value calculation section that calculates a steer-angle correction value by adding the equivalent steer angle to the steer angle;

(d) a desired yaw rate calculation section that calculates a final desired yaw rate based on the steer-angle correction value;

(e) a driving stability decision section that determines a driving stability including a vehicle driveability and a vehicle stability, based on at least a yaw-rate deviation between the actual yaw rate and the final desired yaw rate; and

(f) a yawing-motion control section that controls a yawing motion of the host vehicle by producing the yaw moment corresponding to a final desired yaw moment and acting in a direction that improves the driving stability when the driving stability is deteriorated, the final desired yaw moment being determined to be equal to the controlled variable of the lane deviation prevention control when the vehicle dynamics control is inoperative and determined to be equal to a controlled variable of the vehicle dynamics control when the vehicle dynamics control is operative.

7. The vehicle dynamics control apparatus as claimed in claim 1, wherein:

the lane deviation prevention section estimates a lane-deviation estimate corresponding to a future lateral deviation of the host vehicle from a central axis of the driving lane, based on at least a host vehicle speed, a yaw angle of the host vehicle with respect to a direction of the driving lane, a lateral deviation of the host vehicle from the central axis of the driving lane, and a curvature of the driving lane, and estimates both of a lane-deviation

direction and a possibility of lane deviation, based on a comparison result of the lane-deviation estimate and a predetermined lane-deviation criterion, and determines that there is a possibility for the host vehicle to deviate from the driving lane when the lane-deviation estimate exceeds the predetermined lane-deviation criterion.

8. The vehicle dynamics control apparatus as claimed in claim 1, wherein:

the yawing-motion control section comprises a braking-and-driving force control section being configured to be electronically connected to the actuator so that braking forces of each of road wheels are automatically controlled independently of each other regardless of a driver's braking action.

9. The vehicle dynamics control apparatus as claimed in claim 1, wherein:

the yawing-motion control section is configured to be electronically connected to the actuator so that the yaw moment is produced in a direction that ensures easy change of vehicle heading when the driving stability decision section determines that the vehicle driveability is deteriorated, and that the yaw moment is produced in a direction that improves the vehicle stability when the driving stability decision section determines that the vehicle stability is deteriorated.

10. The vehicle dynamics control apparatus as claimed in claim 1, wherein:

the lane deviation prevention section estimates a lane-deviation estimate corresponding to a future lateral deviation of the host vehicle from a central axis of the

driving lane, based on at least a host vehicle speed, a yaw angle of the host vehicle with respect to a direction of the driving lane, a lateral deviation of the host vehicle from the central axis of the driving lane, and a curvature of the driving lane, and calculates a desired yaw moment corresponding to the controlled variable of the lane deviation prevention control, based on a deviation of the lane-deviation estimate and a predetermined lane-deviation criterion, and determines a braking force and a driving force of each of the road wheels, based on the desired yaw moment corresponding to the controlled variable of the lane deviation prevention control.

11. A vehicle dynamics control apparatus comprising:

sensors that detect at least a turning condition and a driving condition of a host vehicle;

an actuator that produces a yaw moment acting on the host vehicle;

a control unit configured to be electronically connected to the sensors and the actuator, for enabling vehicle dynamics control and lane deviation prevention control, the control unit comprising a processor programmed to perform the following,

(a) determining a driving stability including a vehicle driveability and a vehicle stability, based on at least the turning condition;

(b) executing the vehicle dynamics control by producing the yaw moment corresponding to a controlled variable of the vehicle dynamics control that improves the driving stability when the driving stability is deteriorated;

(c) executing the lane deviation prevention control by producing the yaw moment corresponding to a controlled

variable of the lane deviation prevention control that prevents lane deviation; and

(d) softening a criterion, which is used to determine the driving stability, based on the controlled variable of the lane deviation prevention control, only when the vehicle dynamics control is inoperative.

12. The vehicle dynamics control as claimed in claim 11, wherein the processor is further programmed for:

(e) estimating a yaw-rate deviation between an actual yaw rate resulting from the yaw moment acting on the host vehicle and a final desired yaw rate estimated based on a steer angle and a host vehicle speed;

(f) comparing yaw-rate deviation to a yaw-rate-deviation threshold value; and

(g) initiating the vehicle dynamics control when the yaw-rate deviation exceeds the yaw-rate-deviation threshold value under a condition where the vehicle dynamics control is inoperative; and

wherein softening the criterion of the driving stability is achieved by decreasingly compensating for the yaw-rate deviation based on the controlled variable of the lane deviation prevention control.

13. The vehicle dynamics control as claimed in claim 11, wherein the processor is further programmed for:

(e) estimating a yaw-rate deviation between an actual yaw rate resulting from the yaw moment acting on the host vehicle and a final desired yaw rate estimated based on a steer angle and a host vehicle speed;

(f) comparing yaw-rate deviation to a yaw-rate-deviation threshold value; and

(g) initiating the vehicle dynamics control when the yaw-rate deviation exceeds the yaw-rate-deviation threshold value under a condition where the vehicle dynamics control is inoperative; and

wherein softening the criterion of the driving stability is achieved by increasingly compensating for the yaw-rate-deviation threshold value based on the controlled variable of the lane deviation prevention control.

14. The vehicle dynamics control as claimed in claim 13, wherein:

the yaw-rate-deviation threshold value is fixed to a predetermined low threshold value in a small desired yaw moment range less than or equal to a predetermined small controlled variable, and gradually increases to a predetermined high threshold value as the controlled variable of the lane deviation prevention control increases in a middle and high desired yaw moment range from the predetermined small controlled variable to a predetermined high controlled variable, and is fixed to the predetermined high threshold value in an excessively high desired yaw moment range above the predetermined high controlled variable.

15. The vehicle dynamics control as claimed in claim 11, wherein the processor is further programmed for:

(e) calculating a desired yaw rate based on at least a host vehicle speed and a steer angle; and

wherein softening the criterion of the driving stability is achieved by compensating for the desired yaw rate based on the controlled variable of the lane deviation prevention control to produce a final desired yaw rate and by decreasingly compensating for a yaw-rate deviation between

the final desired yaw rate and an actual yaw rate resulting from the yaw moment acting on the host vehicle.

16. The vehicle dynamics control as claimed in claim 11, wherein the processor is further programmed for:

(e) calculating an equivalent steer angle equivalent to the controlled variable of the lane deviation prevention control; and

wherein softening the criterion of the driving stability is achieved by calculating a steer-angle correction value as a sum of the equivalent steer angle and a steer angle, and by calculating a final desired yaw rate based on the steer-angle correction value, and by decreasingly compensating for a yaw-rate deviation between the final desired yaw rate and an actual yaw rate resulting from the yaw moment acting on the host vehicle.

17. A method of balancing a vehicle dynamics control system and a lane deviation prevention control system, the method comprising:

detecting at least a turning condition and a driving condition of a host vehicle;

determining a driving stability including a vehicle driveability and a vehicle stability, based on at least the turning condition;

controlling a yawing motion of the host vehicle by producing a yaw moment corresponding to a final desired yaw moment and acting on the host vehicle in a direction that improves the driving stability when the driving stability is deteriorated;

selecting a controlled variable of lane deviation prevention control as the final desired yaw moment when the vehicle dynamics control is inoperative;

selecting a controlled variable of vehicle dynamics control as the final desired yaw moment when the vehicle dynamics control is operative;

determining, based on the driving condition, a lane-deviation tendency of the host vehicle from a driving lane;

executing the lane deviation prevention control by producing a yaw moment corresponding to the controlled variable of the lane deviation prevention control and acting on the host vehicle in a direction that lane deviation is prevented; and

compensating for a decision of the driving stability, based on the controlled variable of the lane deviation prevention control.

18. A method of balancing a vehicle dynamics control system and a lane deviation prevention control system, the method comprising:

detecting at least a turning condition and a driving condition of a host vehicle;

determining a driving stability including a vehicle driveability and a vehicle stability, based on at least the turning condition;

executing the vehicle dynamics control by producing a yaw moment corresponding to a controlled variable of the vehicle dynamics control that improves the driving stability when the driving stability is deteriorated;

executing the lane deviation prevention control by producing a yaw moment corresponding to a controlled variable of the lane deviation prevention control that prevents lane deviation; and

softening a criterion, which is used to determine the driving stability, based on the controlled variable (MsL) of

the lane deviation prevention control, only when the vehicle dynamics control is inoperative.

19. The method as claimed in claim 18, further comprising:

estimating a yaw-rate deviation between an actual yaw rate resulting from the yaw moment acting on the host vehicle and a final desired yaw rate estimated based on a steer angle and a host vehicle speed;

comparing yaw-rate deviation to a yaw-rate-deviation threshold value; and

initiating the vehicle dynamics control when the yaw-rate deviation exceeds the yaw-rate-deviation threshold value under a condition where the vehicle dynamics control is inoperative; and

wherein softening the criterion of the driving stability is achieved by decreasingly compensating for the yaw-rate deviation based on the controlled variable of the lane deviation prevention control.

20. The method as claimed in claim 18, further comprising:

estimating a yaw-rate deviation between an actual yaw rate resulting from the yaw moment acting on the host vehicle and a final desired yaw rate estimated based on a steer angle and a host vehicle speed;

comparing yaw-rate deviation to a yaw-rate-deviation threshold value; and

initiating the vehicle dynamics control when the yaw-rate deviation exceeds the yaw-rate-deviation threshold value under a condition where the vehicle dynamics control is inoperative; and

wherein softening the criterion of the driving stability is achieved by increasingly compensating for the yaw-rate-

deviation threshold value based on the controlled variable of the lane deviation prevention control.

21. The method as claimed in claim 18, further comprising:

calculating a desired yaw rate based on at least a host vehicle speed and a steer angle; and

wherein softening the criterion of the driving stability is achieved by compensating for the desired yaw rate based on the controlled variable of the lane deviation prevention control to produce a final desired yaw rate and by decreasingly compensating for a yaw-rate deviation between the final desired yaw rate and an actual yaw rate resulting from the yaw moment acting on the host vehicle.

22. The method as claimed in claim 18, further comprising:

calculating an equivalent steer angle equivalent to the controlled variable of the lane deviation prevention control; and

wherein softening the criterion of the driving stability is achieved by calculating a steer-angle correction value as a sum of the equivalent steer angle and a steer angle, and by calculating a final desired yaw rate based on the steer-angle correction value, and by decreasingly compensating for a yaw-rate deviation between the final desired yaw rate and an actual yaw rate resulting from the yaw moment acting on the host vehicle.

23. A vehicle dynamics control apparatus comprising:

sensor means for detecting at least a turning condition and a driving condition of a host vehicle;

actuating means for producing a yaw moment acting on the host vehicle; and

a control unit configured to be electronically connected to the sensor means and the actuating means, for enabling vehicle dynamics control and lane deviation prevention control, the control unit comprising:

(a) a driving stability decision means for determining a driving stability including a vehicle driveability and a vehicle stability, based on at least the turning condition;

(b) a yawing-motion control means for controlling a yawing motion of the host vehicle by producing the yaw moment corresponding to a final desired yaw moment and acting in a direction that improves the driving stability when the driving stability is deteriorated, the final desired yaw moment being determined to be equal to a controlled variable of the lane deviation prevention control when the vehicle dynamics control is inoperative and determined to be equal to a controlled variable of the vehicle dynamics control when the vehicle dynamics control is operative;

(c) a lane deviation prevention means for determining, based on the driving condition, a lane-deviation tendency of the host vehicle from a driving lane, and executes the lane deviation prevention control by producing the yaw moment corresponding to the controlled variable of the lane deviation prevention control and acting in a direction that lane deviation is prevented; and

(d) a driving stability decision compensation means for compensating for a decision of the driving stability, based on the controlled variable of the lane deviation prevention control.

24. A vehicle dynamics control apparatus comprising:

sensor means for detecting at least a turning condition and a driving condition of a host vehicle;

actuating means for producing a yaw moment acting on the host vehicle;

control means configured to be electronically connected to the sensor means and the actuating means, for enabling vehicle dynamics control and lane deviation prevention control, the control means comprising a processor programmed to perform the following,

(a) determining a driving stability including a vehicle driveability and a vehicle stability, based on at least the turning condition;

(b) executing the vehicle dynamics control by producing the yaw moment corresponding to a controlled variable of the vehicle dynamics control that improves the driving stability when the driving stability is deteriorated;

(c) executing the lane deviation prevention control by producing the yaw moment corresponding to a controlled variable of the lane deviation prevention control that prevents lane deviation; and

(d) softening a criterion, which is used to determine the driving stability, based on the controlled variable of the lane deviation prevention control, only when the vehicle dynamics control is inoperative.